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ABSTRACT

As our industrial-based economy changes into an information-based economy, information activities will continue to permeate rehabilitation. New technology in this area includes computerized occupational information systems used to aid vocational planning. Such systems include the federal government's Job Service Matching System, the Michigan Occupational Information System, and the federally mandated National Occupational Information Coordinating Committee together with its state-level committees. Degree of development and emphases vary from state to state, e.g., some systems permit users to "select out" jobs with prohibitive physical demands. Canada has a highly developed system, and one private one (the Guidance Information System) actually provides for both "aptitudes" and "physical demands" sets of descriptors. Two other systems have been developed specifically with rehabilitation in mind--the ESI-Hester and VOCOMP (Vocational Computer-Assisted Matching Program)--in which the counselor's key input derives from specially administered tests. Overall positive impact of such systems is acknowledged--they amplify productivity. However, they are but one element in the total environment in which computer-assisted job matching may seem like socially undesirable job tracking that fails to suggest how jobs may be restructured. More useful is to view the workplace as "person-oriented," where all workers have special needs of some sort. (CP)

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OCCUPATIONAL INFORMATION SYSTEMS AND THEIR USE IN REHABILITATION

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(Revised)

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Introduction

Every generation claims to live in a new age. Each generation supposes that it confronts massive, insoluble problems the likes of which the world has never seen. Most generations rhapsodize about their passionate determination to remake the world. The human fondness for hyperbole notwithstanding, there is partial truth in all of these claims.

What, then, are the overarching and distinctive truths about our own age? In 1980, how do the broadest discernible social currents impact the tasks of the rehabilitation professional?

Scholars increasingly agree that the dominant social theme of our time is the transition from an industrial-based economy to an information-based economy. In 1977, the U. S. Department of Commerce commissioned Dr. Marc Uri Porat to examine "what it means for the U. S. to evolve from an economy that is based primarily in manufacturing and industry to one that is based primarily in knowledge, communication, and information."[1] In nine volumes, Dr. Porat exhaustively examined the emerging "information sectors" of the U. S. economy and concluded that "46% of the GNP is bound up with information activity"[2] and "nearly half of the labor force holds some sort of informational job."[3]

For rehabilitation professionals and other practitioners in the human services, information activities play an indirect but indispensable role. Record keeping, research, administration, and continuing education are examples of vital information activities without

which client service would be nigh impossible. Certain professionals in the rehabilitation family, counselors, for example, are heavily invested with information collecting and dispensing responsibilities. Moreover, all rehabilitation professionals undergo an "information-intensive" period of academic training in their own specialties. The federally-funded Regional Rehabilitation Continuing Education Programs (RRCEP's) are further examples of significant informational/educational activity in rehabilitation.

In sum: rehabilitation professionals depend on information to help manage their clients' progress, maintain services and facilities, and foster their own professional development. Although not always in immediately visible ways, information activities permeate rehabilitation.

New developments in information technology, coupled with declining per unit costs, are certain to increase both the sophistication and diffusion of machine-based information activity in rehabilitation service delivery. A prime example in this area is the use of computerized occupational information databases as an aid in vocational planning for rehabilitation clients. These powerful systems are already widely diffused throughout high school guidance offices, libraries, community colleges and universities, and other educational and social service institutions. In this paper, we will sample the basic types of occupational information systems now available and attempt a modest assay of their limitations, implications, and potentials for application in rehabilitation.

Background: Efforts of the U. S. Employment Service

Not surprisingly, computerized occupational information systems were first developed for military applications. In the early 1960's, a team at the John Hopkins Applied Physics Laboratory developed a computerized matching system to help the U. S. Navy meet its highly technical manpower requirements. With this sophisticated system, the Navy could search its talent pool for personnel with very specific skills; e.g., an engineer with experience in satellite microcircuitry. The computer's electronic file-handling ability and sorting intelligence provided speedy processing for these specialized personnel needs.

One of the principal workers in this pioneering effort was Mr. Robert Dickmann, now director of the U. S. Department of Labor's Division of Automated Matching Systems. This Division, part of the U. S. Employment Service, now operates the Job Service Matching System (JSMS) in twenty-three states across the U. S.[4] JSMS is deployed via computer terminals in local employment offices and provides data-base searches for both job seekers and employers. The crux of this matching system is the Dictionary of Occupational Keywords, a carefully-compiled thesaurus of "descriptors" derived from the more familiar, Dictionary of Occupational Titles. This thesaurus provides the common vocabulary by which both job applicants and job openings can be described and thereby matched.

Unfortunately, JSMS is not geared to meet the specific information needs of individuals with disabilities. One obstacle to the

development of this specialized service was the difficulty involved in analyzing each occupation in terms of its physical demands. Since the methodology for this type of occupational analysis has been under development for the past thirty-five years,[5] it is conceivable that at some distant future date, it may be integrated into the system.

Of course, rehabilitation clients can still use JSMS directly at their local employment office, perhaps with additional assistance from a rehabilitation counselor. After the JSMS computer has identified suitable job openings, the rehabilitation counselor can approach prospective employers and discuss problems pertaining to the disability. In these situations, the rehabilitation counselor or placement specialist functions both as an advocate for the employment rights of his client and as a resource person for interested employers. Resources offered may include rehabilitation engineering design consultation. Rehabilitation engineers are frequently able to design work-station modifications which make employment practical for qualified individuals who happen to have disabilities.[6]

Other Systems; Sorting Strategies

The federal government is the largest single source of occupational information, but it is still only one entry in a complex, growing, and constantly changing field. States, municipalities, and private corporations have all produced variations on an occupational database theme. These systems are distinguished from the federal JSMS in that their central purpose tends to be guidance and counseling service

rather than placement, per se. Most of these non-federal systems include the same basic informational elements in their occupational files: description of typical job duties, notes on working conditions, salary range, and job outlook for the particular state or locale. Educational requirements and schooling opportunities for the occupation may also be listed. Information on related military occupations, scholarship aid, and graduate school has also been incorporated into numerous systems.

In addition to similar contents, most occupational information systems share similar user formats. All computerized occupational databases employ some type of "sorting strategy" by which the database is accessed by the user. These sorting strategies -- essentially computerized questionnaires -- permit the student or client to identify his or her aptitudes, interests, and qualifications, and examine the collective impact of these personal criteria on the total pool of available occupations.

Some systems currently available employ a sorting strategy which permits the user with a disability to "select out" occupations with prohibitive physical demands. By screening out these apparently impractical occupations, some built-in discriminating capability is provided to the user with a disability. However, given the variety and severity of disabilities encountered in modern rehabilitation practice, it is clear that a more sophisticated system will be required. In order to fully serve clients with severe disabilities, the critical connecting links between the physical demands of the job and the individual's remaining abilities will need to be skillfully programmed.

ACSCI; the Michigan System

One of the benchmarks in the growth of any new social or technological development is the establishment of a collaborative association for mutual aid. By this measure, occupational information systems have come of age. The Association of Computer-Based Systems for Career Information (ACSCI) now reports that over a dozen systems have been developed at the state level alone, and a dozen more are expected to appear in the coming year.[7] The ACSCI Clearinghouse, the association's publication bureau, is housed at the University of Oregon in Eugene, where it shares offices with the central node of the Oregon Career Information System. The Oregon C.I.S. was the first state-based system and has been used as the model for the standards and guidelines in federal grant programs. It is still the most frequently replicated system among other states.

According to Mike McKeever, a Research Assistant at ACSCI, services to rehabilitation clients received a great deal of attention at this year's annual ACSCI conference. Mr. McKeever reports that systems in ACSCI states[8] are already working with rehabilitation agencies in their respective states and that "there is high interest and commitment to continue upgrading these services."[9]

The Michigan Occupational Information System (MOIS), while not an ACSCI member, may still be examined as representative of effective occupational information utilization by a rehabilitation agency. Michigan was one of eight states originally funded by the Department of Labor to develop occupational information systems. The Michigan Department of Education developed the MOIS data files in

three formats: hard copy (print), microfiche, and computer display. In 1979, the MOIS network had grown to include almost 2,000 sites across Michigan, including forty-seven vocational rehabilitation field offices.

MOIS includes 350 occupational descriptions and over 1,400 occupational specialties covering more than 90% of Michigan's employment. Information about each occupation is packaged as a "Moiscript" and includes data on the nature of the occupation, working conditions, worker requirements, earnings and advancement, employment and outlook, education and training, and sources of further information. Certain facets of each Moiscript may be particularly pertinent to rehabilitation clients. For example, script #292, Electrical Sign Installer and Repairer, includes this information on worker requirements:

> "Physically you must...lift objects weighing up to 100 pounds...climb up on ladders and scaffolds... maintain your balance...stoop, kneel, crouch, and crawl ...use your fingers to reach, handle, finger, and feel ...see well...and have good color vision to read color-coded wires."

Clearly, this is useful information to anyone seeking a picture of the physical demands of being an electrical sign installer -- a group of people that might well include rehabilitation counselors and clients. A 1977 survey of Michigan's field counselors indicated that three-quarters of the counselors using MOIS felt that the system had assisted them in selecting vocational objectives for their clients. Moreover, "every counselor who has used MOIS more than 10 times reported that it has helped when selecting vocational objectives for clients."[10] Over half of all counselors felt that MOIS had helped them select training resources for use with their clients.

This last finding suggests an important correspondence between the counselor's familiarity with a new information resource and its effective use. It underscores the central thesis of this paper, namely, that an appreciation of the role of information is vital to effective rehabilitation service delivery. As the Michigan survey summary points out, denying clients access to information within the Moiscripts may, in fact, "perpetuate the selection of stereotypic occupations for various groups of clients based upon inadequate vocational knowledge on the part of the counselor and/or the client."[11] When vocational options are precluded because of the counselor's inability to handle information rather than the client's disability, an urgent problem is at hand.

The NOICC and SOICC's

In the late 1970's, occupational information systems became a matter of national policy. In 1976, the Congress mandated the establishment of a National Occupational Information Coordinating Committee, or NOICC, and fifty state-level committees, known as SOICC's. Two years later, this mandate was expanded in an amendment to the Comprehensive Employment and Training Act. Both pieces of legislation allocated substantial sums for the support and growth of occupational information systems -- the combined authorization was $6-$10 million. The various SOICC's apply for these funds on a competitive basis.

The purpose of NOICC, as outlined in a policy statement recently published in the Federal Register, is to "meet the common occupational information and data needs of the vocational education

programs and employment and training programs."[12] NOICC and its state affiliates are also directed to pay special attention to the information needs of youth as they relate to career decision making.

Although each state and territory now has its own SOICC, the degree of development and emphases vary greatly from state to state. In Colorado, special attention has been paid to the needs of individuals with disabilities. Eight sites were established across the state in a study to determine what modifications, if any, the Colorado Career Information System might make to better serve individuals with disabilities.

These demonstration sites included the Colorado School for the Deaf and Blind, the Denver Public Schools, and other rehabilitation and non-rehabilitation agencies. A vocational rehabilitation counselor was assigned to each site. Over eighty different disabilities, classified in eight broad categories, were represented during the study period.[13]

One of the key findings of the study was that individuals with disabilities need detailed information about the physical demands of various occupations. With help from the project advisory board, the Colorado researchers have selected an initial group of thirty-five occupations for extensive physical demands analyses. This group includes the twenty most frequently accessed occupations during the study period and fifteen other energy and mining occupations common to Colorado.

According to Carol Ishimaru, the study coordinator, the need for detailed physical demands data is only part of the problem. Ms. Ishimaru believes that ultimately new types of database access must be developed for individuals with disabilities -- accessing modes which are keyed to their unique patterns of career decision making. Just as

an individual with mobility impairment may need special access to buildings (e.g., ramps), so might this same individual need special access routes to occupational data (e.g., how far is the job site from my home? is public transit available?). COCIS is now planning further study in this area.

"CHOICES" -- the Canadian Program

CHOICES -- an acronym for Computerized Heuristic Occupational Information and Career Exploration System -- is Canada's impressive entry in this field. Developed under the auspices of the Canadian Department of Manpower and Immigration, CHOICES has received international attention for its bilingual format, multiple accessing strategies, and localized occupational information. The occupational file contains 650 occupations, accessible through four different routes: 1) exploring careers, 2) looking at specific occupations, 3) comparing three different occupations at the same time, and 4) relating careers to specific characteristics. Eventually, CHOICES will be deployed to 3,000-4,000 terminals throughout the Canadian provinces.

Early reports of the system's usefulness to individuals with disabilities are "extremely positive," according to Mr. John McCormick, CHOICES User Services Coordinator.[14] The Canadian National Institute for the Blind is investigating the possibility of piloting CHOICES in their counseling offices via a braille terminal or Visualtek terminal designed for partially sighted individuals.

Can CHOICES find a home stateside? That question is now under study by the Florida Bureau of Research, Dissemination, and Evaluation,

according to reports in the Florida Vocational Journal.[15] According to the Journal, the Bureau is studying how data specific to Florida might be delivered using the accessing formats developed in Canada. The possibility of adding Spanish as a delivery language will also be studied.

Private Sector Systems; the G.I.S.

The development of occupational information systems by the private as well as public sector is perhaps the most persuasive evidence that these systems are in genuine demand. The best-known and largest private sector system is G.I.S. -- the Guidance Information System. Conceptually developed at Harvard University in the 1960's with Office of Education funds, G.I.S. is now commercially marketed by the Houghton-Mifflin and Timeshare Corporation.[16] G.I.S. holds 875 occupational descriptions in its database and offers approximately 300 descriptors to the student or client. The system is deployed in forty-six states at over 3,500 institutional sites including schools, libraries, colleges, correctional centers, C.E.T.A. centers, vocational-technical schools, and rehabilitation agencies.

Two facets of the G.I.S. system are of particular interest to users with disabilities. The "Aptitudes" set of descriptors includes such characteristics as finger dexterity, manual dexterity, color discrimination, etc. The "Physical Demands" set of descriptors offers a checklist of specific physical abilities -- lifting, climbing, reaching, hearing, walking, and so on. As the student constructs his or her desired occupational profile, s/he may exclude any of these variables from consideration.[17]

The COIN System -- A Commercial Entry on the Michigan Model

COIN, or Coordinated Occupational Information Network, is a comprehensive career information system developed in part by the same personnel responsible for the Michigan Occupational Information System, described earlier. Like the Michigan system, COIN is available in both microfiche and computer display formats.[18] COIN is organized into six file areas: occupations, college majors, schools, apprenticeships, military jobs, and school subjects. The utility of the system to users with disabilities is comparable to that of MOIS.

VOCOMP and Hester: Two Commercial Systems Geared to Rehabilitation

In response to the limitations of mainstream occupational information systems, two systems have been developed and marketed recently which are geared specifically to the needs of the rehabilitation community. These systems are VOCOMP (Vocational Computer-Assisted Matching Program) developed by Innovative Software, Inc.,[19] a California concern; and ESI-Hester,[20] offered through a rehabilitation firm based in Chicago. Both companies are pioneers in the application of computer technology to rehabilitation counseling and placement.

In both of these rehabilitation-oriented systems, the rehabilitation counselor plays an integral role. Unlike interactive terminal programs which permit the student to work independently, these rehabilitation systems require specialized input which is provided by the counselor. For example, in the Hester system, a battery of twenty-five tests must be administered to the client. The Hester tests, which take 3-5 hours and can be administered by a testing clerk, measure

such variables as manual dexterity, perceptual accuracy, lifting ability, hand strength, and decision speed. Both systems employ assessment instruments which are commonly used in vocational evaluation, but the VOCOMP system incorporates considerably less formal test data. Both systems also require the counselor to subjectively rate the client on interest and aptitude variables.

Another similarity between these two systems is their mode of access: both are typically mail-processed. In the VOCOMP system, test results and counselor evaluations are coded on a one-page form and mailed to the home computer in California. The computer printout with recommended occupations is returned to the counselor along with an interpretive letter prepared by a professional counselor. Both systems also offer an optional "phone-in" access mode when time is of the essence.

VOCOMP has been piloted with numerous social service agencies and insurance firms in California, and recently expanded its operations to New York state, where it is compiling a customized database with local employment information. Promotional literature distributed by ESI-Hester in late 1979 cited well over 100 institutional users of their system.

A Critique of Occupational Information Systems

The sheer volume of activity in the field of occupational information is sufficient to provoke many questions. How are these systems best used? What are their strengths and limitations? What are the benefits and risks inherent in the dramatically increased

availability of occupational information?

Depending on your perspective, the phenomenon of proliferating occupational information can best be understood as a logical spinoff of computer technology, a new industry, an important social service, or a timely response to legislative mandate. All parties, irrespective of motive, seem to agree that occupational information is a vital resource in our complex, modern society.

Any critique of occupational information systems must then begin with an acknowledgement of their overall positive impact. For all their imperfections and limitations, occupational information systems make an impressive contribution to the fundamental mission of rehabilitation: providing useful direction for human talent and ability. Properly used, these systems can amplify the productivity of both the counselor and the client. The counselor or placement specialist is buoyed by a powerful information tool; the client is drawn to think expansively, and hopefully realistically, about his or her potential in the world of work.

Unfortunately, this tableau of progress, productivity, and potential is not without disturbing features. Occupational information systems are only one element, albeit a powerful one, in the total "information environment." Used in isolation, they present an incomplete and perhaps misleading view of the world of work. After all, the daily six-thirty news is also a source of occupational information. Reports of workplace carcinogens, plant closings, lay-offs, and general economic instability are certainly facts which affect vocational choice.

We cannot be personally cognizant of unpleasant truths and remain professionally oblivious without injury to our clients and ourselves. Our ultimate professional judgments must be seasoned with the full spectrum of available information.

Although occupational information systems efficiently delineate dozens of alternative pathways which potentially link the individual to society, this very efficiency is problematic. From certain perspectives, efficient job matching can also be viewed as socially undesirable job tracking. While it seems paradoxical that a machine dedicated to generating options might functionally be an instrument of social control, such is indeed the danger. While the computer spews options, it never envisions alternative vocations or workstyles beyond the borders of the Dictionary of Occupational Titles. Nor does it suggest how jobs may be restructured or combined to form new jobs. These concerns, which automated occupational information systems have not yet addressed, are certainly legitimate and challenging concerns for the rehabilitation professional.

If our modern, clamorous society is viewed as a vast machine oiled by information, occupational information systems are a new and vital lubricant, greasing the passageway between individuals and productive social roles. In this metaphor, rehabilitation professionals who utilize these systems comprise another subgroup of "social mechanics." As these and other powerful information systems make their way into rehabilitation practice, we would do well to more fully articulate our professional mission and self-concept. As professionals whose business it is to restore and empower human beings, rehabilitation workers have a special responsibility in the trying times ahead.

Towards the Future

As advocates for workers with special needs, rehabilitation professionals are natural partisans for a larger truth: *all workers have special needs*. Whether it be part-time employment or adaptive equipment, a flex-time schedule or work modifications, educational leave or public service leave, all workers have special needs and requirements. Efforts by rehabilitation workers to shape workplace policies which are responsive to those varied needs benefit all workers, not just those with disabilities.

This movement towards a "person-oriented" workplace might well be strengthened in the future by a new generation of occupational information systems. New advances in the techniques of occupational analysis promise a rich yield of data.[21] These analytical techniques, which measure the physical demands of particular occupations with great precision, may make possible the compilation of not just job banks, but task banks. These task banks can be amalgamated with information about rehabilitation engineering devices to form new information resources. This type of powerful database would represent a quantum step in the possibilities for rehabilitation placements.

Neither a broadened movement for a responsive workplace nor improved occupational information systems are inevitable developments. Certainly, the rehabilitation community cannot accomplish these changes on its own. Political alliances among like-minded professional associations will be necessary. A strong, public-minded professional voice, rooted in a clear professional self-concept, can provide a sturdy mooring as rehabilitation enters the ambiguities of the information age.

NOTES

1. Porat, Dr. Marc Uri. The Information Economy: Definition and Measurement. U.S. Department of Commerce; Office of Telecommunications Special Publication 77-12 (1). May, 1977.

2. Ibid., p. 1.

3. Ibid.

4. The Center for Automated Matching Systems in Albany, New York, handles the "export" of on-line JSMS software under contract to the Department of Labor. C.A.M.S. is also responsible for the training of state employment commission staff in the system's use. Ms. Pat Barkenhagen, Senior Training and Documentation Specialist at the Center, graciously provided the reference materials cited in note (5) of this paper.

5. The earliest citation encountered in this investigation was published in 1945 by the U.S. Bureau of Employment Security: Physical Demands and Physical Capacities Appraisal (U.S. Government Printing Office, Washington). This 1945 report was footnoted in a 1961 publication entitled Physical Demands Manual, published by the Occupational Analysis Branch of the same bureau. The twenty-seven "physical activity" variables defined in the 1945 report were consolidated into six broad categories in the 1961 manual. These same six categories also appear in a 1974 report, Estimated Requirements of Occupations: Educational Development, Specific Vocational Preparation, Physical Demands, and Working Conditions, published by the Center for Occupational Education at North Carolina State University at Raleigh. In a phone call placed to the Division of Occupational Analysis in November, 1979, Mr. Arden Nelson informed me that a supplement to the new Dictionary of Occupational Titles (4th edition) is now under preparation. This supplement will index occupations according to physical demands and is scheduled for publication in early 1980.

6. Rehabilitation engineering devices have been totally absent from occupational databases, a distinct disadvantage to the job seeker with a disability. In more than a few instances, rehabilitation engineers are able to design special adaptive equipment or work station modifications which make employment practical. A comprehensive occupational information system geared to rehabilitation clients would certainly include a file of rehabilitation engineering case studies. In such a system, the student interested in a particular occupation could peruse abstracts of rehabilitation engineering solutions in that field to see if those devices or variations thereof might be personally useful.

7. ACSCI Clearinghouse, 247 Hendricks Hall, University of Oregon, Eugene, Oregon 97403. 503/686-3872.

8. Alabama, Colorado, California, Massachusetts, Minnesota, New York City, Ohio, Oregon, Washington, and Wisconsin.

Notes, continued

9. Personal letter to author, December 11, 1979.

10. Brewer, Richard. "Impact Evaluation of the Michigan Occupational Information System: Results of Counselor Survey." Michigan Department of Education, Bureau of Rehabilitation. October, 1977.

11. Ibid., pp. 2-3.

12. The Federal Register, December 12, 1979, p. 72067.

13. A copy of the final report of this project may be obtained from Ms. Mary Lou Aberle, Research and Development Analyst, COCIS, University of Colorado, Willard Administrative Center, Room 7, Boulder, Colo. 80303. Telephone 303/492-8932.

14. Personal letter to author, November 15, 1979. Information about CHOICES may be obtained by writing Mr. John M. McCormick, CHOICES User Services Co-ordinator, Employment and Immigration Canada, Ottawa, Canada K1A 0J9. Telephone 819/994-2660.

15. Florida Vocational Journal, January-February, 1979, p. 9.

16. Guidance Information System, Timeshare Corporation, 630 Oakwood Avenue, West Hartford, Connecticut 06110. Telephone 203/522-0136.

17. While the selectivity offered by these characteristics is certainly an asset, their utility in actual rehabilitation counseling may be limited due to the complexity and specificity of many disabilities. At best, such broad descriptors might aid in identifying occupations hithertofore neglected in the student's or counselor's mind. At worst, however, they may eliminate occupations from consideration for which the student could be well-suited given appropriate adaptive equipment or job restructuring.

18. COIN, Instructional Technology, Inc., Box 492, Easton, Maryland 21601. Telephone 301/822-0370.

19. Innovative Software, Inc., 19824 Ventura Boulevard #102, Woodland Hills, California 91364. Telephone 213/884-5581. East coast representative: David Loeding, telephone 203/322-3341.

20. ESI-Hester, Evaluation Systems Sales and Services, Inc., 809 West Madison, Chicago, Illinois 60607. Telephone 312/666-0394.

21. Mr. Jim Scott, Program Consultant with the Michigan Bureau of Rehabilitation, has recently informed me of a promising project between his Bureau and the University of Michigan's College of Engineering. The University has equipped a Mobile Occupational Assessment Laboratory which will travel about the state to various work sites. The laboratory carries equipment for circulatory and metabolic monitoring, environmental monitoring, task-specific strength and reach assessment, and biomechanical analysis. This data will be used to augment descriptions of physical work requirements in the Michigan Occupational Information System. Mr. Scott can be reached at Box 30010, Lansing, Michigan, 48909; telephone 517/373-3978.